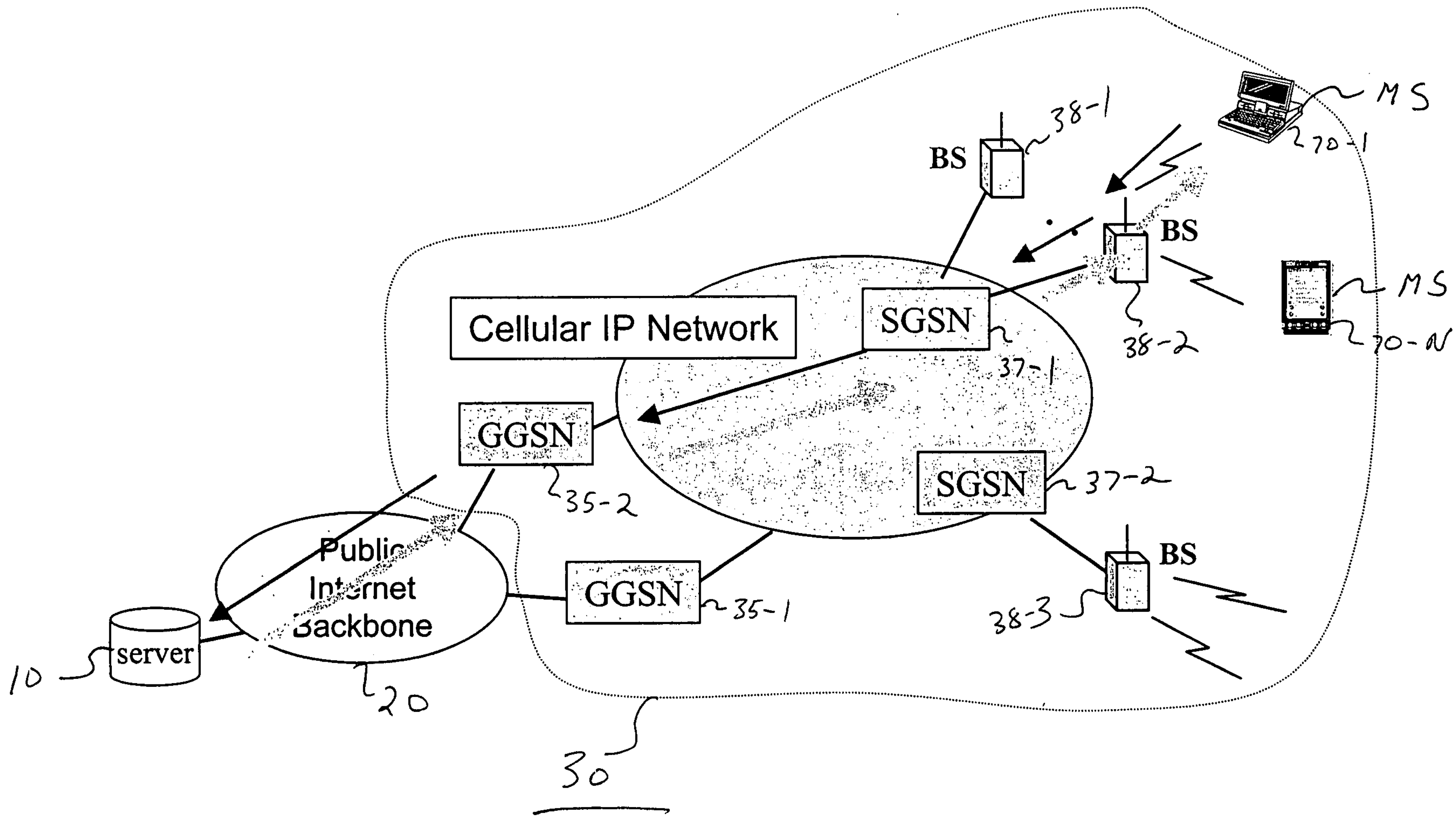
Cellular data network

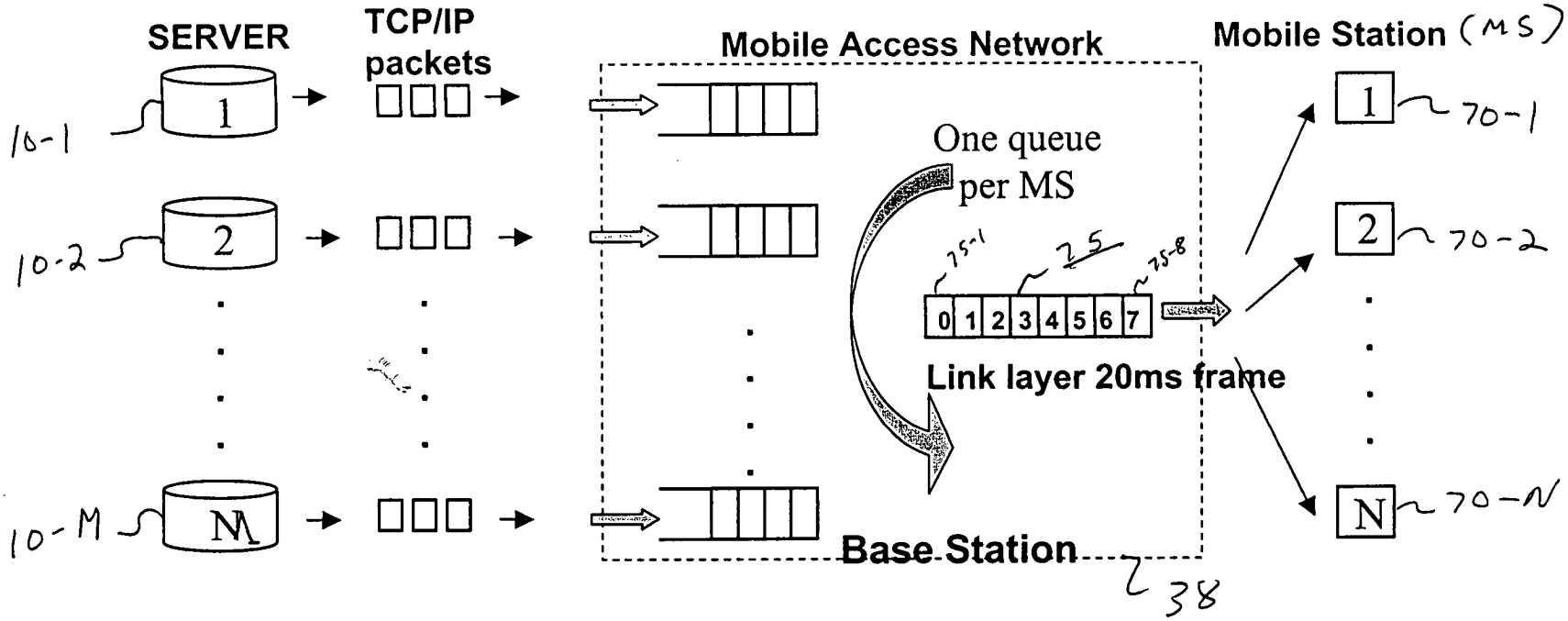
FIGURE 1A



IPS2000-0104

Scheduling at base-station

FIGURE 1B



- WFQ scheduling to serve non-empty queues
- Transport protocol: TCP/IP
- Realistic Internet traffic model

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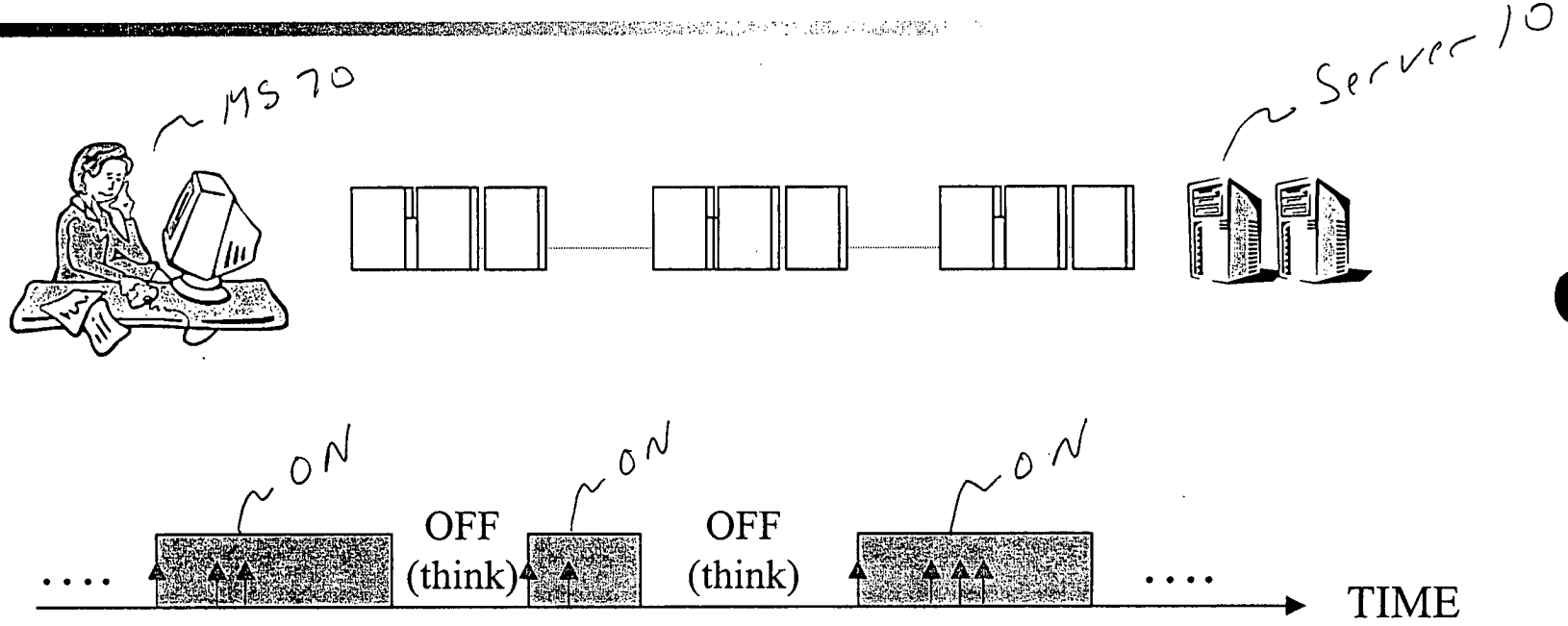
IDS 2000-0104

Workload model



- Surge model
  - → Request sizes, embedded references, OFF (think) time.
- File size: average - 8.2kB, median - 3kB
- User data rate: ~ 12kbps (decrease as loading increases)

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WFQ scheduling with equal weights

50% MCS-8 Users, 50% MCS-6 Users

FIGURE 3

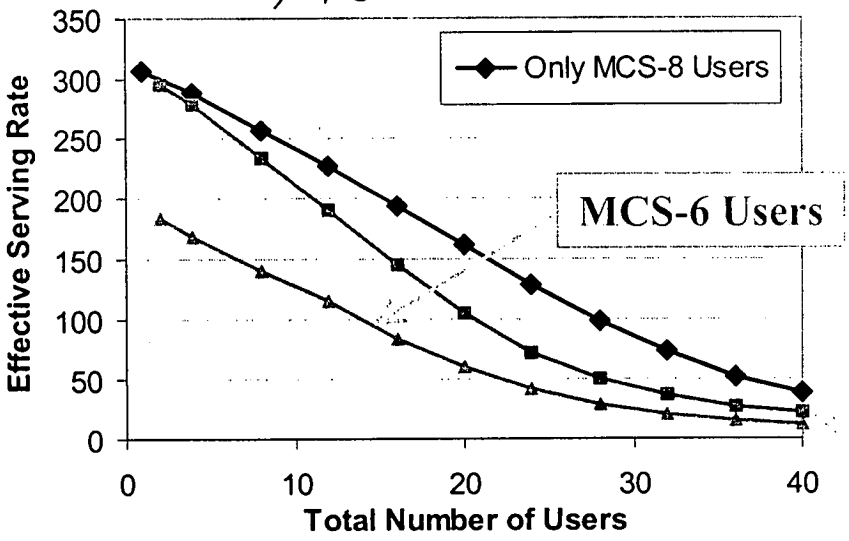
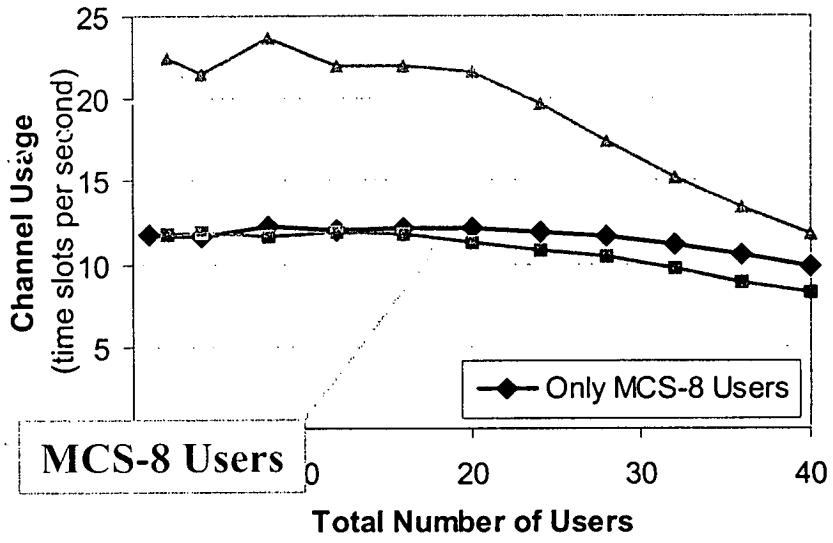


FIGURE 4



- MCS-6 users has lower rates while consuming more resources.
- MCS-8 users also suffer from MCS-6 users' poor channel quality.

Q: Whose performance to improve ?

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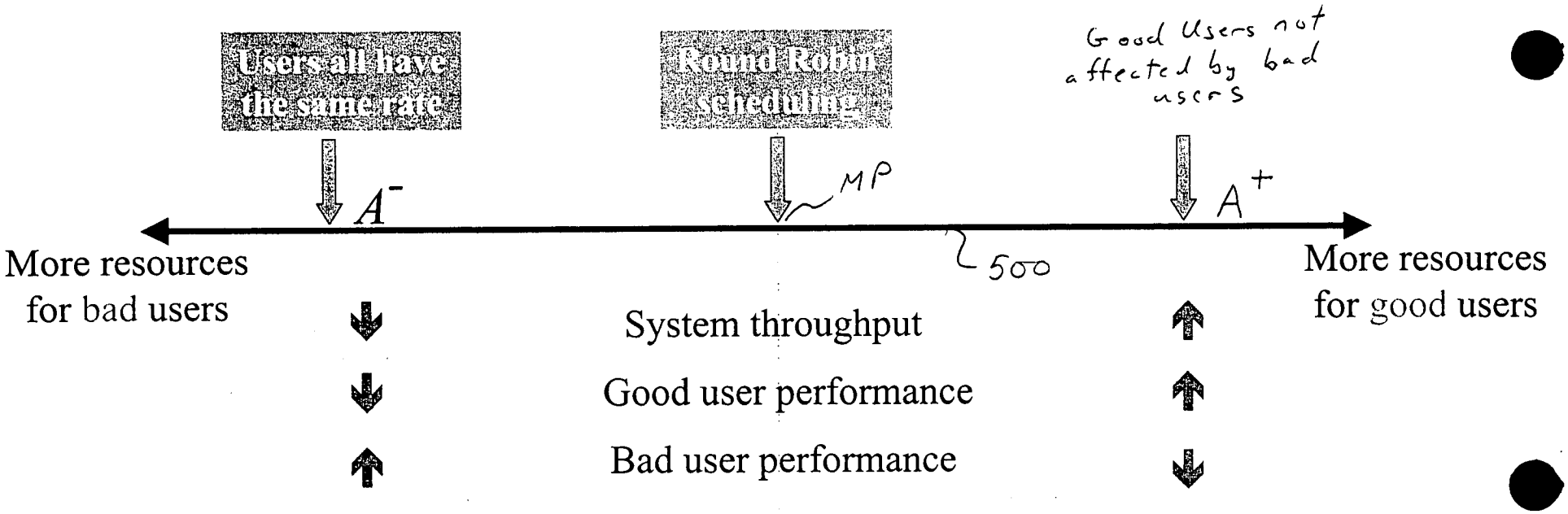
Options of the system - *the scheduling axis*

FIGURE 5



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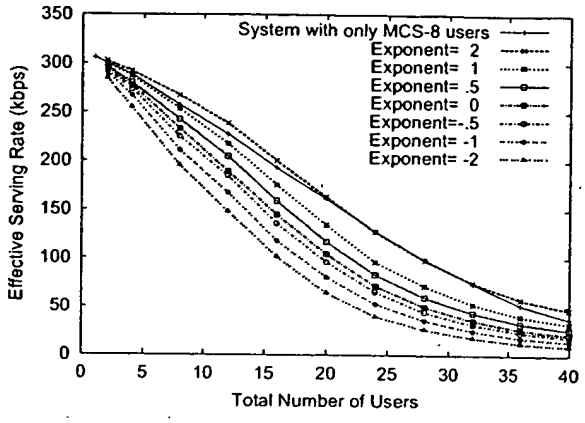
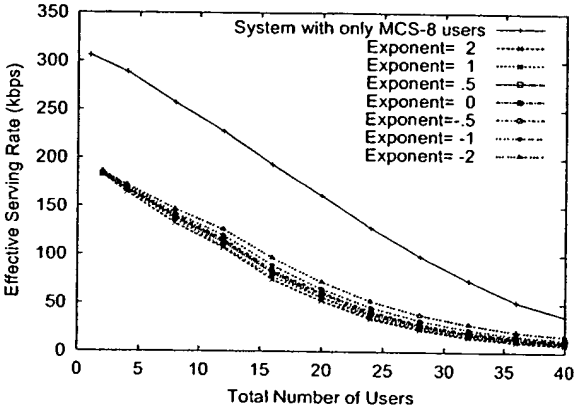


a) Effective Serving Rates of MCS-8 Users



b) Effective Serving Rates of MCS-6 Users

Fig. 6. Performance of users when 1/2 are MCS-8 users and 1/2 are MCS-6 users.

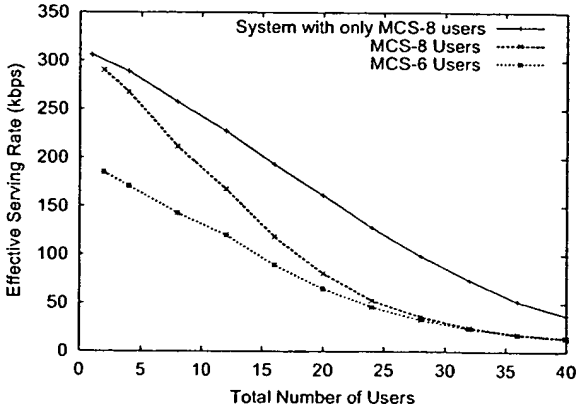
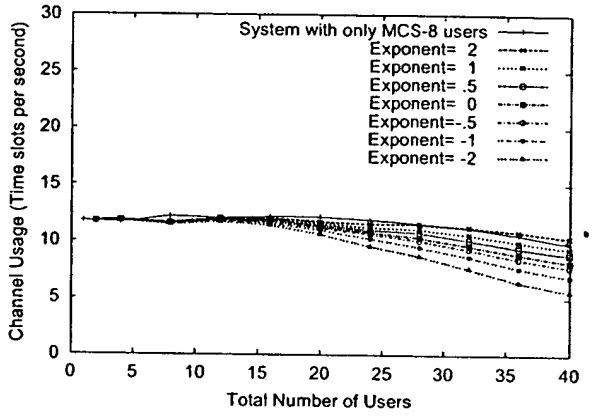
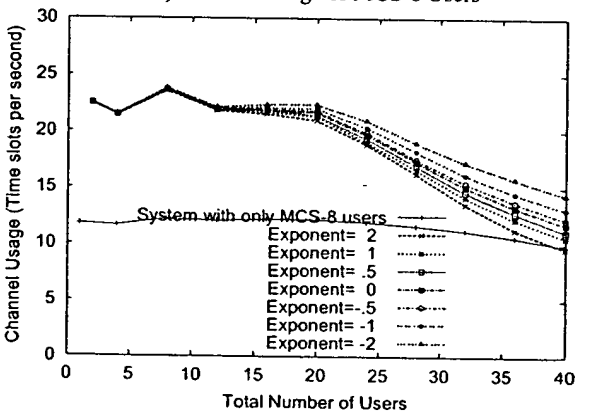


Fig. 7. User performance at exponent=-1.

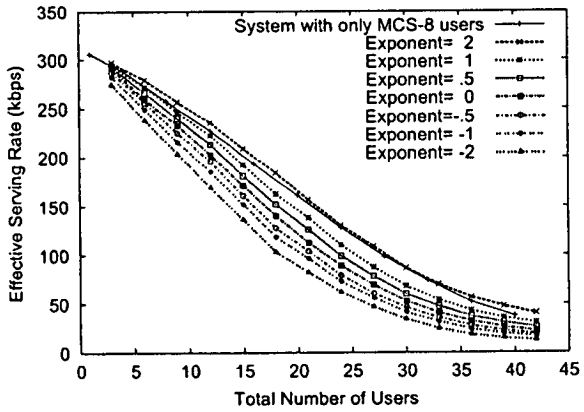


a) Channel Usage of MCS-8 Users

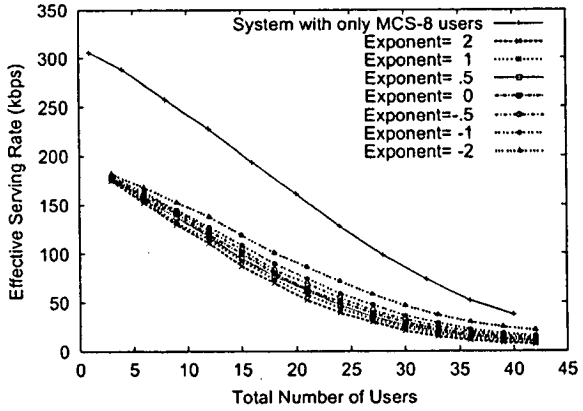


b) Channel Usage of MCS-6 Users

Fig. 8. Channel usage of users when 1/2 are MCS-8 users and 1/2 are MCS-6 users.

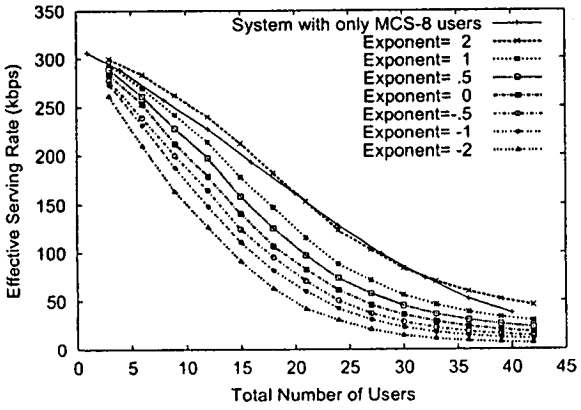


a) Effective Serving Rates of MCS-8 Users

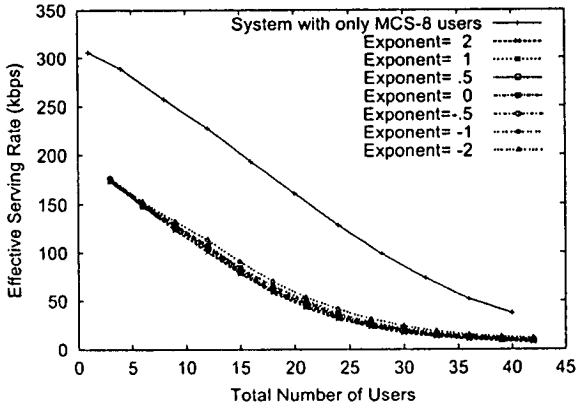


b) Effective Serving Rates of MCS-6 Users

Fig. 9. Performance of users when 2/3 are MCS-8 users and 1/3 are MCS-6 users

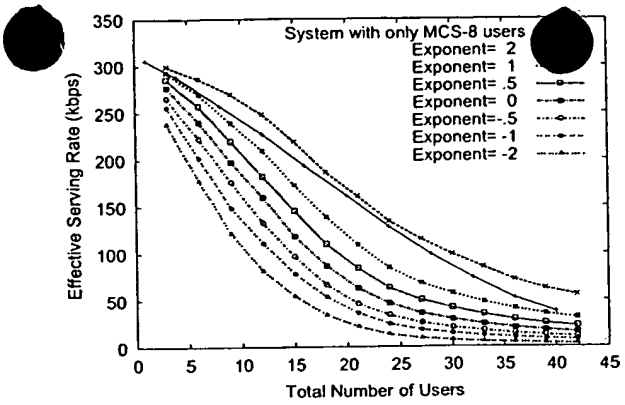


a) Effective Serving Rates of MCS-8 Users

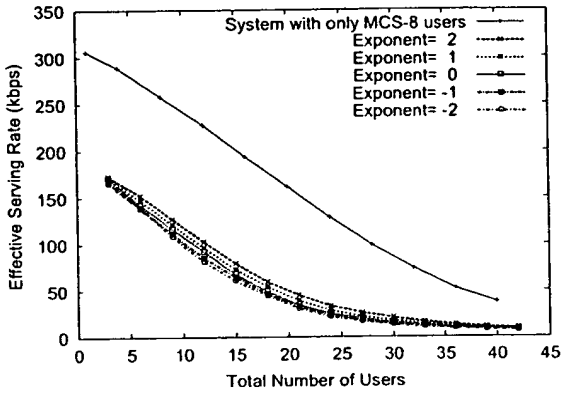


b) Effective Serving Rates of MCS-6 Users

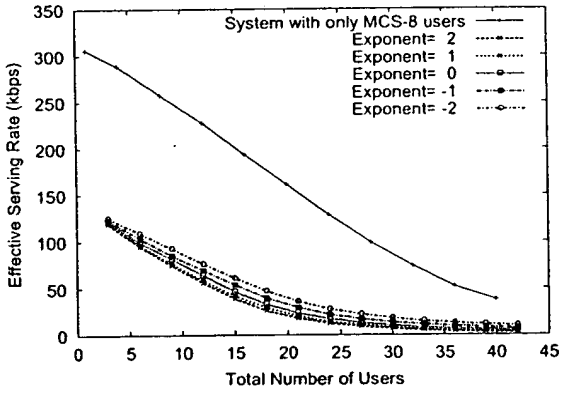
Fig. 10. Performance of users when 1/3 are MCS-8 users and 2/3 are MCS-6 users



a) Effective Serving Rates of MCS-8 Users

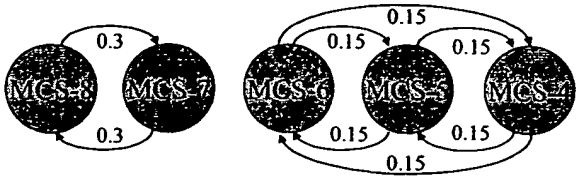


b) Effective Serving Rates of MCS-6 Users



c) Effective Serving Rates of MCS-4 Users

Fig. 11. Performance of users when there are equal numbers of MCS-8, MCS-6, and MCS-4 users in the system.

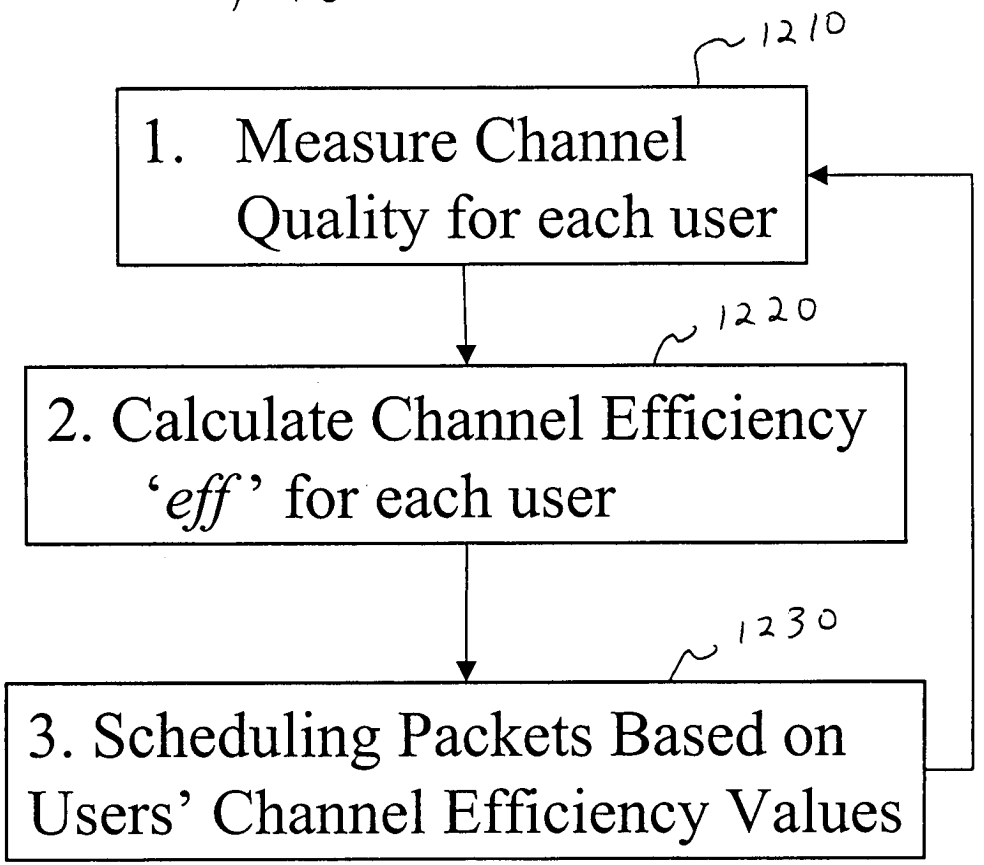


Type A User Type B User

Fig. 12. Channel state transition diagram (the prob. of remaining in the same state is 0.7 for all the states).

System Flow

FIGURE 13(a)



Packet Scheduling Algorithms

FIGURE 13B